

Year 12 Physics - Math review

SOLUTIONS

Sheet 3: Equations – calculators allowed!

1) Solving equations – show all working

a)	$3 + x = 37$ $x = 34$	b)	$15 - y = 23$ $y = -8$
c)	$-2x + 3 - 10x = 78$ $x = -75/12 = -6.25$	d)	$4(x + 7) = 52$ $x = 6$
e)	$5x^2 = 125$ $x = 5$	f)	$\frac{20}{x} = 3.2$ $x = 20/3.2 = 6.25$

2) Equations with 3 variables – show all working

a) $V = IR$

If the volatage (V) is 12V across a 36Ω resistor (R), calculate the current (I)

$$I = 12/36 = 0.3333 \text{ A} = 0.33 \text{ A (2 s.f.)}$$

b) $v = d/t$

Calculate the distance (d) a runner would cover if they ran at a velocity (v) of 3.1ms^{-1} for a time (t) of 360s

$$d = 3.1 \times 360 = 1116 \text{ m}$$

c) $v = d/t$

Calculate the time (t) it would take a runner to cover a distance (d) of 3km at a constant velocity (v) of 4ms^{-1}

$$t = 3000\text{m} / 4\text{ms}^{-1} = 750\text{s} = 12\text{min } 30\text{s (this is a good one to demonstrate dim analysis)}$$

3) Equations with 4 variables – show all working

d) $F = BIL$

A piece of wire of length (L) 55cm is in a magnetic field (B) of 2.5T. It experiences a force (F) of 5.5N. Calculate the current (I) in the wire

$$I = 5.5 / (2.5 \times 0.55) = 4.0 \text{ A}$$

e) $F = Bqv$

If a force (F) of 1.3N acts on a charge (q) of 120C in a magnetic field (B) of 0.005 T, calculate the velocity (v) of the charge

$$v = 1.3 / (0.005 \times 120) = 2.167 \text{ ms}^{-1} = 2.17 \text{ ms}^{-1} \text{ (2 s.f.)}$$

4) Equations with squares:

f) $E = \frac{1}{2}mv^2$

If a runner has a mass (m) of 78kg and gains 284J of kinetic energy (E), calculate the velocity (v) of the runner

$$v = \text{sqrt}(2 \times 284 / 78) = 2.6985 \text{ ms}^{-1} = 2.7 \text{ ms}^{-1} \text{ (2 s.f.)}$$